

## THE LIGHTS THAT GUIDE IN THE NIGHT.

BY LIEUTENANT JOHN M. ELICOTT, U. S. N.

WHEN ships are sailing upon the ocean the lights of heaven are their guides. Even in the dark ages, when the compass and sextant were unknown instruments, the seemingly motionless pole-star hung like a beacon light in the northern heavens, and the rising and setting of the sun and stars distinguished the east from the west. When, however, ships come near the land the lights of heaven are not sufficient safely to guide them. Rocks lie in their paths unseen in the night; reefs and shoals spread under the water; while unsuspected currents sweep the frail craft all blindly upon these dangers.

Nevertheless, ships were sailed along dangerous coasts for centuries before a plain system of marking dangerous places was invented. The early mariners were bold and reckless rovers, more than half pirates, who seldom owned a road of the coasts along which they sailed, and could not have established lights and landmarks on them had they cared to do so. The rude beginning, then, of a system of lighthouses was when the merchants with whom the reckless mariners traded in those dark ages built beacons near the harbor mouths to guide the ships into port by day, and lighted fires for their guidance at night. As such a harbor-guide had to be a sure landmark in the daytime and a light by night, it soon took on a settled shape—a tower on which could be built a fire; and such a tower was usually built of stone.

This method of guiding ships into the ports which they sought was scarcely established before human wickedness used it as a means for their destruction. Bands of robbers, or, as they came to be called, "wreckers," would hide themselves somewhere near the haven sought by a richly laden vessel, and after overpowering the fire-keepers would extinguish the beacon-fire on the night on which the ship was

expected. Then they would light another fire near some treacherous reef. The mariner, sailing boldly toward the false light, would dash his vessel to destruction on the reef, whereupon



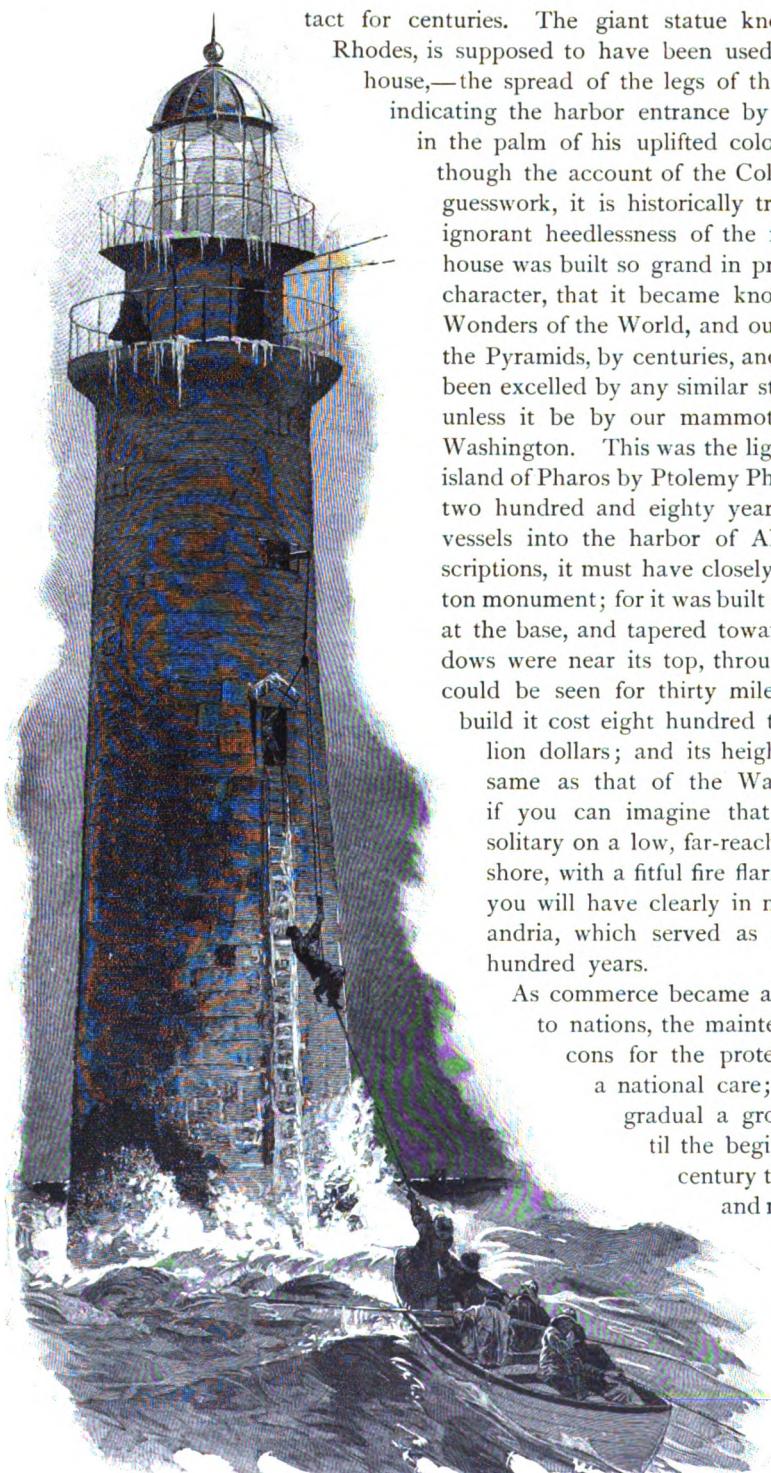
A SCREW-PILE OCEAN LIGHTHOUSE ON FOWEY ROCK, FLORIDA.

the robber band would plunder the wreck and make off with the booty.

The Mediterranean Sea was the great cradle of commerce, and some of the ancient beacon-towers at the entrance to its harbors stood in-

tact for centuries. The giant statue known as the Colossus, at Rhodes, is supposed to have been used as a beacon and lighthouse,—the spread of the legs of that great figure of Apollo indicating the harbor entrance by day, while a fire burned in the palm of his uplifted colossal hand at night. Although the account of the Colossus is only a matter of guesswork, it is historically true that in those ages of ignorant heedlessness of the need of beacons a lighthouse was built so grand in proportions, so enduring in character, that it became known as one of the Seven Wonders of the World, and outlived all the others, save the Pyramids, by centuries, and in some ways has never been excelled by any similar structure in modern times, unless it be by our mammoth marble monument to Washington. This was the lighthouse built on the little island of Pharos by Ptolemy Philadelphus, king of Egypt, two hundred and eighty years before Christ, to guide vessels into the harbor of Alexandria. From all descriptions, it must have closely resembled our Washington monument; for it was built of white stone, was square at the base, and tapered toward the apex. Open windows were near its top, through which the fire within could be seen for thirty miles by vessels at sea. To build it cost eight hundred talents, or nearly one million dollars; and its height was almost exactly the same as that of the Washington monument; so if you can imagine that great column standing solitary on a low, far-reaching, yellow, sandy desert shore, with a fitful fire flaring from its top at night, you will have clearly in mind the Pharos at Alexandria, which served as a lighthouse for sixteen hundred years.

As commerce became a source of great revenue to nations, the maintenance of lights and beacons for the protection of vessels became a national care; but this was of so very gradual a growth that it was not until the beginning of the seventeenth century that the building, lighting, and maintaining of lighthouses was looked after with regularity by all governments. The best proof of the slowness of nations to see the necessity of properly lighting their coasts is afforded by Great Britain, as a rule the most advanced commercial



A WINTER LANDING AT THE MINOT LEDGE LIGHT.

nation. During the reign of Queen Elizabeth a religious brotherhood known as "the Brotherhood of the Most Glorious and Undivided Trinity" was directed by an act of Parliament to

preserve ancient sea-marks, and to erect beacons and "signs of the sea." For more than a hundred years this brotherhood kept up the ancient sea-marks, but erected nothing new; then they began to purchase and operate lights owned by private individuals or by societies; and still later they commenced to build lighthouses and beacons. Finally, in 1856, Parliament gave Trinity House the entire control of the lighthouses of England.

Meantime the means of lighting was being steadily improved. The open fire gave place to the oil-lamp; then a curved mirror, called a parabolic mirror, was placed behind the lamp to bring the rays together; next, many lamps with mirrors were grouped about a central spindle and some such lights are still in operation. The greatest stride came when an arrangement of lenses, known as the Fresnel lens, in front of a lamp replaced the mirror behind it. This lens was rapidly improved for lighthouse purposes, until now a cylindrical glass house surrounds the lamp-flame. This house has lens-shaped walls which bend all the rays to form a horizontal zone of strong light which pierces the darkness to a great distance.

The rapid increase in the number of lighthouses has made it necessary to have some means of telling one from another, or, as it is termed, of giving to each light its "characteristic." Coloring the glass made the light dimmer, but as red comes most nearly to white light in brightness, some lights have red lenses. The latest and best plan, however, is to set upright prisms at intervals in a circular framework around the lens, and to revolve this frame by clockwork. Thus the light is made to flash every time a prism passes between it and an observer. By changing the number and places of the prisms, or the speed of the clockwork, the flashes for any one light can be made to occur at intervals of so many seconds for that

light. Putting in red prisms gives still other changes. Thus each light has its "characteristic," and this is written down in signs on the charts, and fully stated in the light-lists carried by vessels. Thus, on a chart you may note that the light you want to sight is marked "F. W. v. W. Fl., 10-sec.," which means that it is "fixed white varied by white flashes every ten seconds." When a light is sighted you see if those are its characteristics; and, if so, you have found the right one.

Another scheme is used on the coasts of France, in addition to those I have told you. It is a means for swinging a vertical beam of light across the sky at regular times. Thus the

SECTION OF A FRESNEL LENS.




THE LIGHTHOUSE AT ST. AUGUSTINE, FLORIDA.

whereabouts of a light can be discovered by the appearance of its beam long before the light itself shows above the horizon.

Lighthouse buildings are variously painted

so that they will have a "characteristic" by day. Thus some towers are red, some black, some white and black in horizontal or vertical stripes, some checkerboarded, and some painted in spiral bands like those on a barber's pole as in the picture on page 483.

One seldom thinks, when he watches the

comfortably situated lighthouses are generally on lonely headlands, with no human dwelling near. Others are on outlying rocks, or islands swept by the sea, and wholly cut off from the land except in fair weather. There are even a few which, built upon sunken reefs, seem to rise from the very bed of the ocean, and against which storm-driven seas break with shocks which shake them to their foundations. Such are the Eddystone Lighthouse, off the coast of England at the entrance to the English Channel, and our own Minot's Ledge Light, near the entrance to Boston Harbor. These two are the most isolated and exposed lighthouses in the world. They were built at the utmost peril to human life. Each was swept away by storms after completion, and had to be rebuilt.

The first lighthouse on Minot's Ledge was built in 1848. It was an octagonal tower resting on the tops of eight wrought-iron piles eight inches in diameter and sixty feet high, with their bases sunk five feet in the rock. These piles were braced together in many ways; and, as they offered less surface to the waves than a solid structure,



IN A NORTHEASTER.

brightly cheering and safely guiding light of a lighthouse, what ceaseless watching and patient heroism it takes to keep the light burning year in and year out through all weathers. Generally there is for each light only a keeper with two assistants, and often the keeper is assisted only by his wife, sons, or daughters. Even the most

this lighthouse was considered by all authorities upon the subject to be exceptionally strong.

Its great test came in April, 1851. On the 14th of that month, two keepers being in the lighthouse, an easterly gale set in, steadily increasing in force. People on shore, and no doubt the keepers themselves, watched the heavy seas



THE WRECK OF THE FIRST MINOT'S LEDGE LIGHTHOUSE.

ENGRAVED BY R. C. COLLINS.

sweep harmlessly through the network of piles beneath the house, and feared no harm. On the 15th, however, the wind and sea had greatly increased, and the waves were flung higher and higher toward that tower in the air. Yet, all thought they surely could not reach sixty feet above the ledge!

That night was one of keen anxiety, for the gale still increased; and all through that dreadful driving storm and darkness, the faithful keepers were at their posts, for the light burned brightly. On Wednesday, the 16th, the gale had become a hurricane; and when at times the tower could be seen through the mists and sea-drift, it seemed to bend to the shock of the waves. At four o'clock that afternoon an ominous proof of the fury of the waves on Minot's Ledge reached the shore—a platform which had been built between the piles only seven feet below the floor of the keepers' room. The raging seas, then, were leaping fifty feet in the air. Would they reach ten feet higher?—for if so the house and the keepers were doomed. Nevertheless, when darkness set in the light shone out as brilliantly as ever; but the gale seemed, if possible, then to increase. What

agony those two men must have suffered! How that dreadful abode must have swayed in the irresistible hurricane, and trembled at each crashing sea! The poor unfortunates must have known that if those seas, leaping always higher and higher, ever reached their house, it would be flung down into the ocean, and they would be buried with it beneath the waves.

To those hopeless, terrified watchers the entombing sea came at last. At one o'clock in the morning the lighthouse bell was heard by those on shore to give a mournful clang, and the light was extinguished. It was the funeral knell of two patient heroes.

Next day there remained on the rock only eight jagged iron stumps.

During this same gale another lighthouse, twenty-five miles out at sea on that New England coast, was sore beset. It was on a barren rock of considerable area, known as Matinicus Rock; and besides the tower there were substantial stone buildings for the keeper's family and for storing supplies. The keeper had gone away for provisions, leaving an invalid wife and four daughters in the station. The eldest daughter, a girl of seventeen, was in charge of the

light. During the first day's gale the seas began to sweep entirely over the rocks, washing away everything movable, and flooding the lower rooms of the dwelling. The roar of the surf and the wind was so great that the poor women could not hear one another's voices. At this stage of the storm the young girl remembered her chickens, and determined to save them. Taking a large basket, she stood at an upper window watching the sea. When there came a quiet

spell she rushed out of the dwelling, dashed ankle-deep through the sea-water draining from the rocks, dragged the poor drenched hens from the perches where they had taken refuge from the waves, placed them in the basket, and dashed back into the house again, with all saved — all but one, which was out of her reach, and for which she could not linger; for hardly had she secured the door and retreated again to the upper floor,

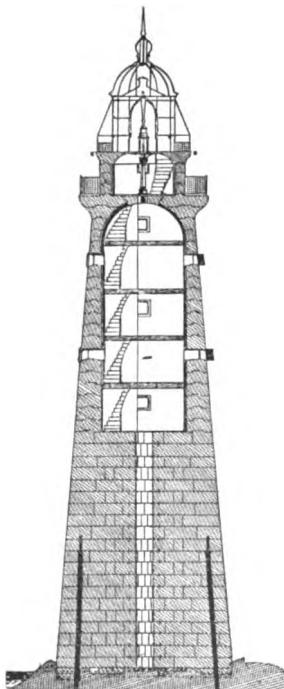
when a most terrific sea broke over the rocks, sweeping away every house except the stone dwelling and its light-tower. As the storm grew worse, the dwelling had to be abandoned, and all lived in the light-tower for three days and nights, dur-



MINOT'S LEDGE AFTER THE STORM OF 1851.

ing which the little light-keeper never lost her nerve, but kept the light burning as regularly as clockwork.

Lighthouse-keepers do not seem to feel their lonely life. I once spent a week on Scotland Lightship, near the entrance to New York harbor. The assistant keeper was in charge, and he was nearly stone deaf. He had not been ashore for three months, and even a newspaper



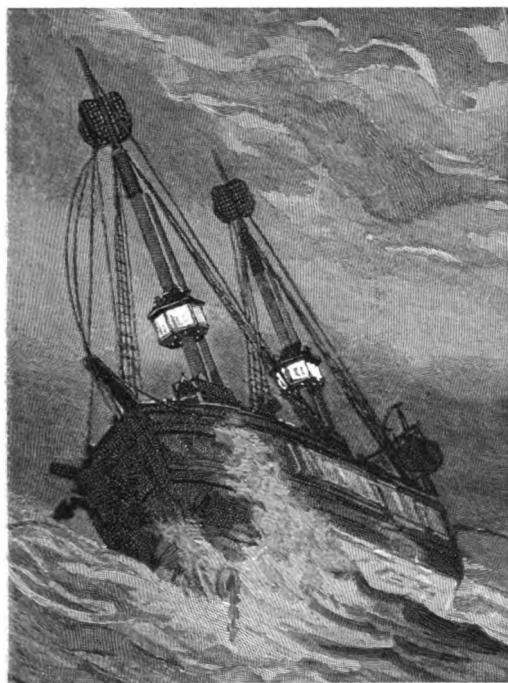
SECTION OF THE PRESENT MINOT'S LEDGE LIGHT.



Sketch of the screw at the end of the pile.

SCREW-PILE RIVER LIGHTHOUSE.

came to him only by chance from time to time, when a pilot-boat stopped by on her way out of the harbor. From sunrise until nine o'clock at night he did little else but sit on a hatchway



THE SOUTH SHOAL LIGHT-SHIP, OFF NANTUCKET.

smoking an old pipe and gazing reflectively at the great harbor receiving and dismissing its thousands of vessels. One day he asked me to use my influence to get him transferred to Cape Cod. I asked him why he wished the change.

"Well," said he, very seriously, "I want a quieter station; it's too lively here; I want to be where there is less going on!"

Light-ships take the place of lighthouses on shoals which are too much exposed, or where sands are too shifting to allow lighthouses to be built on them. These vessels are very securely moored, and newer ones have auxiliary steam-power, so that if they should break adrift in a storm they could steam into the nearest port for shelter, or lie to until the gale abated. Their light and lenses surround one or both of their masts, and in the daytime are lowered down into a little house at the foot of the mast. At night the lamps are lighted, and the lights hoisted up again to the mastheads. On some shoals, usually in rivers and bays, where the water is not too deep and the sea is never violent, lighthouses are built on a trestlework supported by iron piles screwed into the sand.

The entire lighthouse system of the United States is in charge of a board consisting of two army engineer officers and two naval officers of high rank, and two civilians. This board is under the Treasury Department, and the Secretary of the Treasury is *ex officio* president. Its meetings are held in the Treasury Building in Washington. The country is divided into sixteen lighthouse districts, as follows: first to sixth districts, Atlantic coast; seventh and eighth districts, Gulf Coast; ninth to eleventh districts, the Great Lakes; twelfth and thirteenth districts, Pacific coast; and the remaining three districts include the Ohio, Mississippi, Missouri, and Red rivers. Each district is in charge of a naval officer who is termed an inspector. The headquarters of the third district, on Staten Island, is the principal depot of supplies. Lamps and lanterns are made there; all oil is tested there; and all lighting apparatus is set up and worked there before being sent to its destination. Light-keepers are paid from \$600 to \$1000, while the assistant keepers receive from \$400 to \$600 a year.



THE FOG-BELL.



ON A QUIET DAY.